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ABSTRACT

Two studies were performed to investigate the effects of material and task variations in the acquisition of cognitive learning strategies. Groups of undergraduate students were taught to use mental imagery, meaningful elaboration, and grouping. The type of training task or the order of training and test materials differed for each of the experimental groups. Study and test materials included free recall and paired-associate word lists as well as reading passages. The results partially supported the need for training materials to be ordered from easy to more difficult. However, the type of training necessary to optimize learning appears to be dependent upon several factors, including the difficulty level of the materials with which the strategies will be used and the types of tests used to assess what has been learned. (Author)

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Technical Report 461

THE EFFECTS OF MATERIAL AND TASK VARIATIONS ON A BRIEF COGNITIVE LEARNING STRATEGIES TRAINING PROGRAM

Claire E. Weinstein, Thomas P. Washington, Frank W. Wicker,
David C. Duty, and Vicki L. Underwood
University of Texas at Austin

PERSONNEL AND TRAINING RESEARCH LABORATORY

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Claire E. Weinstein, Thomas P. Washington, Frank W. Wicker,
David C. Duty, and Vicki L. Underwood
University of Texas at Austin

PERSONNEL AND TRAINING RESEARCH LABORATORY

Approved by:

E. Ralph Dusek, Director
Personnel and Training
Research Laboratory

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
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FOREWORD

The Personnel and Training Research Laboratory of the Army Research Institute for the Behavioral and Social Sciences (ARI) conducts research to support training methods to optimize skill acquisition and retention. A variety of research is being conducted on the effects of various learning strategies on skill acquisition and retention. ARI, in cooperation with the Defense Advanced Research Projects Agency (DARPA), is especially interested in training that improves the trainee's ability to learn.

This report is one of a series on the development of the Cognitive Learning Strategies Training Program. This report presents the effects of material and task variations on a brief Cognitive Learning Strategies Training Program. Research was conducted at the University of Texas at Austin with the assistance of Hobart Hukill and Dean Johnston. It was done under contract DAHC19-76-C-0026, monitored by Joseph S. Ward of ARI under Army Project 2Q161102B74F, and funded by DARPA.

Joseph Zeidner

JOSEPH ZEIDNER
Technical Director

THE EFFECTS OF MATERIAL AND TASK VARIATIONS ON A BRIEF COGNITIVE LEARNING STRATEGIES TRAINING PROGRAM

BRIEF

Requirement:

To investigate the effects of material and task variations on the acquisition of cognitive learning strategies.

Procedure:

Two studies were conducted. In the first, 75 undergraduate students were randomly assigned to one of three types of tasks to be practiced: paired-associate learning, reading comprehension, or a combination of paired-associate learning and reading comprehension. All students were trained to use three different cognitive strategies: mental imagery, meaningful elaboration, and grouping.

In the second study, 50 undergraduates were randomly assigned to one of two groups, which differed only in the order of presentation of the practice readings. One group studied two simple passages and then two difficult passages while the other group studied the difficult passages first. All students were trained to use three different cognitive strategies: mental imagery, meaningful elaboration, and grouping.

Findings:

The results partially supported the need for the easier training materials to be presented before the more difficult. However, the type of training necessary to optimize learning appears to depend on several factors, including the difficulty level of the materials with which the strategies will be used and the types of tests used to assess what has been learned.

Utilization of Findings:

Certain types of learning can be enhanced by acquiring cognitive learning strategies. Training materials should be ordered according to difficulty to facilitate the acquisition of cognitive learning strategies. Further research is needed on the use of cognitive learning strategies and the optimal procedures required to teach them to learners.

THE EFFECTS OF MATERIAL AND TASK VARIATIONS ON A BRIEF COGNITIVE LEARNING STRATEGIES TRAINING PROGRAM

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THE EFFECTS OF MATERIAL AND TASK VARIATIONS ON A BRIEF COGNITIVE LEARNING STRATEGIES TRAINING PROGRAM

Introduction

As scholastic achievement scores continue to decline nationally, many psychologists, educators, and parents have realized the need for educational reform. The thrust of much of the criticism of current educational practices centers around the dearth of effective instructional procedures which could enhance students' ability to learn. Basic to this problem is the belief that students will learn simply because they have been assigned a task and have been provided with an appropriate text or other instructional aid. The underlying assumption that every student will somehow innately or automatically acquire the skills necessary to learn and remember new information is misleading. While many students do develop these skills on their own, little has been done to systematize the process of teaching learning skills.

Effective learning strategies, such as the method of loci, have been available for hundreds of years (Bower, 1970). However, the scientific study of these strategies has been neglected until recently. Within the last few years a number of researchers have investigated several types of highly effective learning and memory techniques involving elaboration of the material that is to be learned (Bower, 1970; Norman, 1976; Rohwer & Ammon, 1971; Smith & Marshall, 1976; Weinstein, Underwood, Wicker & Cubberly, in press; Yuille & Catchpole, 1973, 1974). Elaboration strategies enable the learner to enhance the meaningfulness of information to be learned by relating this new information to the learner's current knowledge, or

cognitive structure (Rohwer, 1970).

A study by Weinstein (1978) investigated the effects of an elaboration skills training program upon the learning efficiency of ninth-grade students. A variety of learning strategies, learning tasks, and stimulus materials were chosen to provide the learners with guided practice in the use of elaborative mediational skills. Unlike previous studies, a variety of cognitive strategies including sentence elaboration, imaginal elaboration, analogies, drawing implications, creating relationships, and paraphrasing were included in the training. The learning tasks selected ranged from simple paired-associates and free recall to reading comprehension. Stimulus materials were drawn from ninth-grade curriculum materials in science, history, English, foreign language, and vocational education.

In this study, 75 ninth-grade students were randomly assigned to one of three groups: training/experimental, control, or posttest-only. Students in the experimental group participated in a series of five 1-hour elaboration skill training sessions, administered at approximately 1-week intervals. Students were exposed to a set of 19 learning tasks. They were required to create a series of elaborators, or mediational aids, for each of these tasks. Experimenter-provided directions for the early tasks emphasized the properties of an effective elaborator. The latter training sessions provided opportunities for additional practice in using these skills with little or no experimenter-provided instructions. Students in the control group were exposed to the same stimulus materials but their task was simply to learn the information without any type of strategy prompts or directions. A posttest-only group was not exposed to the stimulus materials but did participate in the posttesting sessions. The

immediate posttest was administered 1 week after the conclusion of the training and the delayed posttest was administered approximately 1 month later. Both immediate and delayed posttests consisted of reading comprehension, free recall, paired-associate, and serial recall tasks.

The results of the data analysis for the immediate posttest revealed significant differences between group means on the free recall task and Trial 2 of the paired-associate learning task. In each instance the experimental group's performance surpassed the performance of the control and posttest-only groups, which did not differ significantly from each other. On the delayed posttest a significant difference was obtained for the reading comprehension task and Trial 1 of the serial learning task. Again these differences favored the experimental group. It seemed that students could learn to utilize these elaboration strategies in a variety of task situations but further research was still required to determine the optimal conditions for their learning and use.

As research attesting to the utility of these strategies accumulates, the issue of how to effectively and efficiently teach these skills arises. The two studies described in this report represent our initial attempts to investigate a number of instructional variables such as the types of training and testing materials, the order in which different materials should be presented and the types of learning tasks. The results of these exploratory studies are being used in optimizing the design of a training program to teach adult learners to use effective cognitive learning strategies.

Type of Training Task

The first study in this set was designed to investigate the generalizability of training in selected learning strategies across different types

of tasks. The two learning tasks selected for study were paired-associate learning and reading comprehension. The strategies taught included mental imagery, meaningful elaboration, and grouping. The cluster of strategies involving imagery calls for the formation of a mental picture by the learner of the person, events, or information to be learned. Elaboration, as used here, involves enhancing the meaningfulness of to-be-learned material by relating it to the learner's current cognitive structure. For example, as a student or trainee reads through a passage he or she might ask and answer such questions as, "What is the purpose of this material?" or "How does this relate to my knowledge, experience, beliefs, and attitudes?" or "What are the logical relationships in the material?" or other similar questions which are designed to involve the learner in actively relating to the new information. Grouping, as used in this research, is actually a combination of strategies whereby the learner first clusters information according to meaningful relationships by putting similar materials together and then uses imagery, sentence formation, or other forms of elaboration to learn the elements in each cluster.

Method

Participants. The 75 students who participated in this study were drawn from several sections of an introductory educational psychology course at the University of Texas at Austin. Participation in research was part of their course requirement.

Materials. Four paired-associate lists of ten noun pairs each were constructed using the norms developed by Paivio, Yuille, and Madigan (1968). List 1 was composed of high-concrete words (ratings in the range of 4.75 to

7.00) of average meaningfulness (ratings in the range of 4.75 to 6.50). List 2 included high-meaningfulness words (ratings were 6.50 and above) of average concreteness (ratings in the range of 3.00 to 4.75). List 3 consisted of low-concrete words (ratings in the range of 1.00 to 3.00) of average meaningfulness (ratings in the range of 4.00 to 6.50). List 4 was chosen randomly.

The reading selections were taken from the Science Research Associates (SRA) Lab IVa (1959) materials corresponding to grade levels 8, 10, 12, and 14. The training materials included an eighth-grade reading about cars of the future, a tenth-grade reading concerning the balance of nature, a twelfth-grade reading about influenza epidemics, and a fourteenth-level reading that dealt with conceptions of time. The testing materials included a twelfth-grade reading about impulsive buying in supermarkets, a fourteenth-level reading concerning the nature of the human psyche, and the ten question muliple-choice tests provided with each of these two readings in the SRA (1959) materials.

Design and Procedure. Students were assigned to one of three treatment conditions defined by the type of tasks they practiced: paired-associate learning, reading comprehension, or a combination of paired-associate learning and reading comprehension. Students were trained and tested in groups ranging in size from five to nine individuals. Each group was randomly assigned to one of the three treatment conditions. Students in the paired-associate group (N = 25) were trained in the use of cognitive strategies for paired-associate lists only. For the readings group (N = 25), short written passages were used to demonstrate and practice the strategies. For the combination group (N = 25), the strategies were demonstrated and practiced on both the paired-associate tasks and the written passages.

All students were given the same posttest, which included a paired-associate task, a free recall task, and multiple-choice questions over two written passages.

The students were trained in the use of three different cognitive strategies--mental imagery, meaningful elaboration, and grouping--which were described to them as aids in organizing, remembering, and adding meaning to the study materials. (A copy of the experimenter's directions for the combination group may be found in Appendix A.)

These strategies were explained and demonstrated one at a time using a sample paired-associate list in the case of the paired-associate group, a sample reading in the case of the readings group, or both in the case of the combination group. Following the explanation of each strategy, the experimenter asked the students to use the strategy with the sample material and then asked the group for two or three examples of the aids they created. The experimenter provided feedback by commenting on the examples provided by the students, either by saying why it was a good example, or by elaborating on it to make a more appropriate example of the strategy under discussion. For the paired-associate group and the readings group, the strategies were discussed only once. For the combination group, however, each strategy was discussed twice, once in conjunction with paired-associate tasks, and then, in conjunction with written passages. After all three strategies had been presented, the students worked on the four practice tasks.

For the paired-associate group, the practice lists were presented in the same order as they were discussed in the materials section of this study. The students were allotted 8 minutes to practice using the three cognitive strategies to learn the word pairs in each list. The students in the readings group were given 10 minutes to practice using the strategies to learn the information contained in each of the four practice readings.

More time was allotted for the reading tasks than the paired-associate tasks because data from a pilot study suggested that the reading tasks took longer to complete.

The combination group was also given four practice tasks. These were the second and fourth tasks from each of the other two groups. Students in this condition were first given a paired-associate task (List 2) and then the tenth-grade-level reading, followed by another paired-associate task (List 4) and the fourteenth-grade-level reading. They were given 8 minutes to practice the strategies on each paired-associate list and 10 minutes to practice the strategies on each reading.

At the beginning of the first practice task, students in each of the groups were instructed to try to use all three strategies--imagery, meaningful elaboration, and grouping--in learning the material. These instructions were repeated at the beginning of every practice task thereafter. In addition, the students were asked to write down the aids that they developed for the first two practice tasks. This procedure created an opportunity for the experimenter to provide feedback regarding the appropriateness of each student's use of the strategies. The students were then asked to practice the use of the strategies mentally (i.e., without writing down their aids) on the last two practice tasks.

The testing phase began immediately after training was concluded. The four tasks used for testing were a paired-associate task, a free recall task, and two reading comprehension tasks.

For the paired-associate test, 40 nouns from the Paivio et al. (1968) norms were selected and paired at random, yielding 20 word pairs. The word pairs were presented one at a time on a Da-Lite screen using a Kodak

slide projector with an automatic timing device. The study-test method was used with a 10-second exposure of each pair for the study portion and an 8-second exposure of the stimulus word for the test portion.

For the free recall test, 20 nouns were selected at random from the Paivio et al. (1968) norms. The words were presented one at a time by a slide projector, at a presentation rate of 6 seconds per word. After all 20 words were presented, the students were given 2 minutes to write down as many of the words as they could recall, regardless of order.

For the reading comprehension test, two reading selections were taken from the SRA (1959) materials. The first was a twelfth-grade-level reading and the second was a fourteenth-grade-level reading. The two readings each had 10 multiple-choice questions associated with them, and these were used as the test materials.

The students were each given a printed copy of the first reading selection and allowed 5 minutes to study the passage using the strategies they had learned. Then the readings were collected, and a sheet of 10 multiple-choice questions was given to each student. Students were given 2 minutes to answer the questions. This procedure was repeated for the second reading which was slightly longer than the first. The students were given 6 minutes to study this passage and 3½ minutes to answer the questions. (The times allowed for the study and test portions were established during pilot testing with a similar group of students.) The entire session lasted approximately 2 hours, with the testing phase requiring 35 minutes of that time.

Results and Discussion

Analyses of variance of the test scores revealed no significant differences among the three treatment conditions on any of the tests. Although

these results could indicate either no effects for any of the treatments or that students can readily generalize their improved skills, any conclusions must remain tentative because of the group performance patterns. On the first (easier) passage, group means indicated nearly perfect scores for all three of the treatment groups; on the more difficult reading nearly identical low mean scores were found (see Table 1). It is possible that the tests used, which were drawn without alteration from the SRA (1959) materials, may have been inappropriate in their level of difficulty for the students in this study. Consequently, for the studies that followed this one the experimenters designed and pilot-tested new test items rather than relying on the standard questions.

The second study in this set was designed to investigate the variables of difficulty and order of difficulty of both training and testing materials. Reading comprehension was used as the learning task and mental imagery, meaningful elaboration, and grouping were the strategies presented.

Order of Training Materials

Method

Participants. A total of 50 students enrolled in several sections of an introductory course in educational psychology at the University of Texas at Austin participated in this research study as part of their course requirement.

Materials. The practice and testing materials consisted of short passages taken from the SRA (1959) materials corresponding to ninth- and fourteenth-grade levels. Of the reading selections chosen at each of these grade levels, two were designated as practice passages and one was chosen as a test passage. The ninth-grade readings were designated as simple

TABLE 1

Means and Standard Deviations for the Three Experimental Groups in the Type of Training Task Study

Test	Group	N	Mean	SD
PAL (Maximum Score = 20)	Paired-Assoc. Group	25	13.44	4.43
	Readings Group	25	12.80	3.69
	Combination Group	25	13.88	3.32
Free Recall (Maximum Score = 20)	Paired-Assoc. Group	25	11.20	3.55
	Readings Group	25	11.20	2.48
	Combination Group	25	12.40	2.57
Reading 1 (Maximum Score = 10)	Paired-Assoc. Group	25	9.60	.71
	Readings Group	25	9.48	1.01
	Combination Group	25	9.64	.64
Reading 2 (Maximum Score = 10)	Paired-Assoc. Group	25	5.36	1.50
	Readings Group	25	5.36	1.75
	Combination Group	25	5.28	1.40

passages (S), and the fourteenth-level readings were designated as difficult passages (D).

The themes of the selected readings were varied to avoid special emphasis in any single content area. The first simple practice passage discussed tornadoes; the second pertained to the etymology of the word satellite. The first difficult practice reading concerned attitudes toward death in American culture; the second was concerned with the conflict of good and evil in world literature. The simple test passage dealt with unusual plants that eat animals, and the difficult test passage discussed the nature of the human psyche.

Accompanying the simple and the difficult test passages were two tests for each reading. These tests were composed of both open-ended questions and multiple-choice questions written by the experimenters and pilot-tested with students similar to those participating in this study. Each of the four tests had 10 questions.

All instructions were included in printed student packets. These packets included explanations of the learning strategies and examples of their use. (A copy of a student packet may be found in Appendix B.)

Design and Procedure. The 50 students were randomly assigned to one of two treatment groups, which differed only in the order of presentation of the practice readings. The first group (N = 23) received the two simple passages followed by the two difficult passages (SSDD). The second group (N = 27) received the two difficult passages followed by the two simple passages (DDSS). The presentation order of passages with the same difficulty level was identical for both groups. Training and testing were conducted in groups of four to seven students.

All students were trained to use imagery, meaningful elaboration, and grouping with a sample passage about alternate conceptions of education by Kneller (1971). The practice readings were then presented one at a time. The students were instructed to practice applying all three of the learning strategies to each passage to learn the information contained in it, and to write down examples of the aids they created. Six minutes were allowed for the students to read each simple passage and apply the strategies; 10 minutes were allowed for each difficult passage. During this time, the experimenter provided individual feedback and guidance to the students.

Following practice on the four readings, all students were tested on their ability to use the strategies to learn the information contained in the two test readings. The simple test reading was presented first to all students with 3 minutes allotted for reading. Following this study interval, the appropriate open-ended test was given, with 6 minutes allowed to complete the test. The multiple-choice test followed. This test had a 3-minute time limit. The students were then given the difficult test reading, and allowed 7 minutes to study this passage. Six minutes were allowed for the open-ended test and 4 minutes were allowed for the multiple-choice test over this passage.

A control group (N = 25), which had been obtained as part of another study, received neither training in the strategies nor an opportunity to practice learning materials of the type studied by the training groups. However, these students were examined over the same testing materials.

Results and Discussion

A 3 x 2 x 2 analysis of variance (groups x reading difficulty x question type) was used to analyze the data. The main effect of groups

was not significant, but the main effects of reading difficulty and question type were significant ($F(1,72) = 15.06$, $p < .001$ for reading difficulty; $F(1,72) = 23.41$, $p < .001$ for question type). Thus, scores were higher on simple than on difficult readings, and were also higher on multiple-choice than on open-ended questions (see Table 2).

The interaction of groups and reading difficulty was significant ($F(2,72) = 4.25$, $p < .05$) indicating that the group that received two simple passages followed by two difficult passages (SSDD) and the group that received two difficult passages followed by two simple passages (DDSS) performed above the control group on the simple reading, but on the difficult reading, the SSDD and control groups performed above the DDSS group. The interaction of reading difficulty and question type was significant ($F(1,72) = 90.11$, $p < .0001$), indicating that open-ended test scores were higher on the simple reading, but multiple-choice test scores were higher on the difficult reading. The interaction of groups and question type was not significant.

The interaction of groups, reading difficulty, and question type was significant ($F(2,72) = 3.88$, $p < .05$). The form of the interaction was similar for all groups; however, the extent of the interaction differed (see Figure 1). For the SSDD group, multiple-choice and open-ended test scores were not different on the simple reading, but on the difficult reading open-ended test scores were below multiple-choice test scores. For the control group, open-ended test scores were above multiple-choice test scores on the simple reading, but were below them on the difficult reading. The form of the interaction for the DDSS group was similar to that of the control group, except that the open-ended test scores on the difficult reading were farther below the multiple-choice test scores.

TABLE 2

Means and Standard Deviations in the

Order of Training Materials Study

Training Group	Reading Difficulty	Question Type	Mean	SD
SSDD (N = 23)	Simple	Multiple-Choice	7.52	1.31
		Open-Ended	7.40	2.06
	Difficult	Multiple-Choice	7.70	.93
		Open-Ended	5.47	1.90
DDSS (N = 27)	Simple	Multiple-Choice	6.85	1.61
		Open-Ended	7.96	2.36
	Difficult	Multiple-Choice	7.22	1.05
		Open-Ended	4.46	1.73
Control (N = 25)	Simple	Multiple-Choice	6.28	2.30
		Open-Ended	7.13	2.90
	Difficult	Multiple-Choice	7.36	1.78
		Open-Ended	5.96	2.06

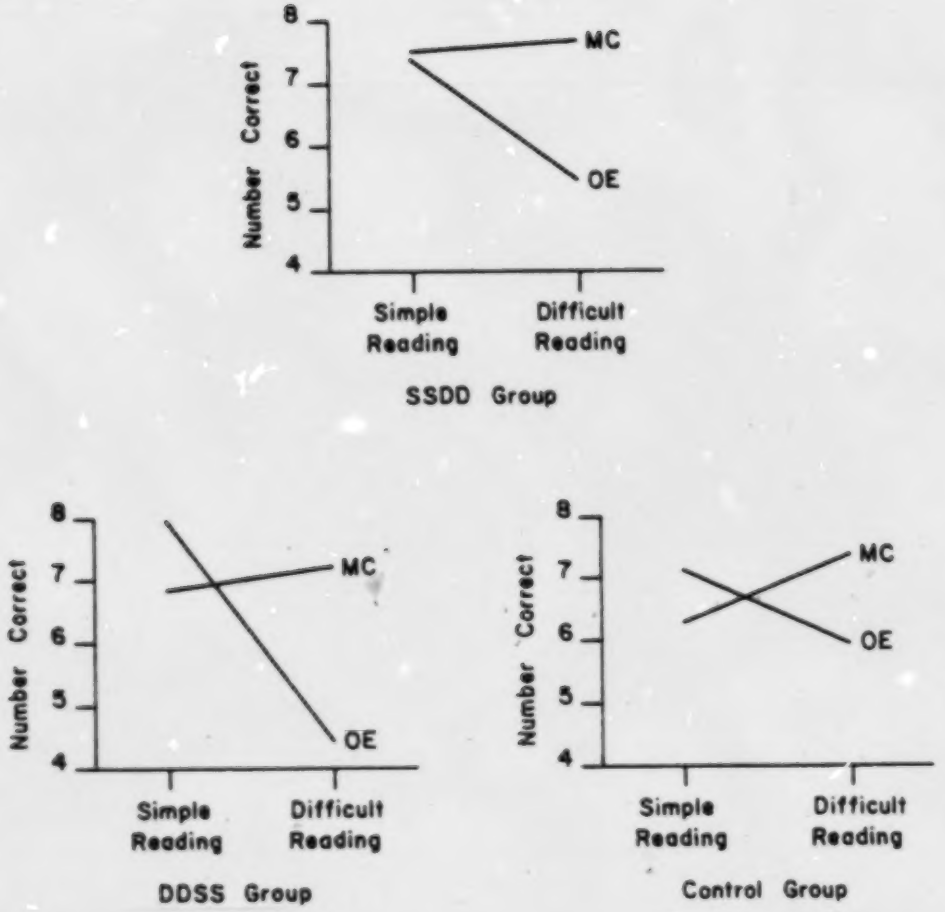

Figure 1. Interaction of groups, reading difficulty, and question type in the Order of Training Materials study (MC = multiple-choice, OE = open-ended).

In general, the multiple-choice test scores did not differ greatly across groups or readings, but the open-ended test scores did, such that the scores of the DDSS group were below those of the SSDD and control groups. Open-ended tests are more reflective of recall processes than are multiple-choice tests, and in educational and training contexts, recall is usually more highly valued than recognition. Therefore, the results of this study suggest that in developing a training program for teaching cognitive learning strategies, the level of student performance may be decreased if presentation of training materials begins with difficult materials. Though this may seem like a common-sense notion, it is important to note that until recently such variables have rarely been investigated by researchers in the field.

Future Directions

The research and development effort described in this report will continue as part of the Cognitive Learning Strategies Project at the University of Texas at Austin. The goals of this project are to refine our understanding of the covert processes involved in utilizing cognitive strategies for learning and retention, and to design, develop and field test training programs to modify learner's information processing strategies.

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APPENDIX A

Experimenter Directions for the Combination Group in the Type of Training Task Study

Hello. I want to thank you for coming here today (tonight). My name is _____ and I am interested in developing better learning methods. During this period I will tell you about a number of methods that are helpful for learning. You will get to practice these methods, or strategies, for the first part of the period. Then, during the last part of the session we will test you to see how well you have learned them. This is not an intelligence test. You, the student, are not being tested; rather, together we will test the learning strategies that you are going to learn. Obviously, the better you learn the strategies the more we can find out about them when we test. So, even though you may find these learning strategies new and different, try to master them as best you can during the practice session.

Are there any questions?

Okay. Let's begin.

Training Instructions

Paired-Associate Task

In this study we are going to be working with two types of materials. The first type is what psychologists call paired-associates. You are given a list of word pairs and your task is to learn to associate the two words in each pair so that later, when you are shown the first word you will remember the second word. The second type of material we will be working with is written passages.

We are going to use examples to demonstrate a number of methods or strategies that should help you to learn the material. We will work through the examples a number of times so you can see what I mean by each of the different strategies; first with a paired-associate list, then with a sample passage. Then you will practice the strategies on two additional paired-associate lists and two additional written passages. After you have practiced the strategies, we will, together, test the effectiveness of the strategies on some other materials.

Are there any questions?

Okay, look at the sample list. (Hand out list.)

All of the strategies we will be learning are aids in organizing, remembering, and adding meaning to the word pairs. We are going to learn them one at a time so you can get a feel for each of them.

The first strategy deals with what is called mental imagery. In reading the pairs of words you may have noticed that a mental picture "popped" into your head. This is an example of what is meant by mental imagery. We are going to concentrate on these images to help you learn the material. For example, to help you remember the first word pair--COFFEE - STREET--you might form a picture in your mind of a man spilling his coffee in the street. Or you might imagine a giant coffee pot from Mars pouring gallons of hot, black coffee onto a busy city street. For EDUCATION - BALLOON you might form an image of walking into the education building and finding it filled with balloons. These are examples of using your imagining ability to add meaning to or make a meaningful connection within the word pair. It doesn't matter how strange your image is as long as it makes it meaningful to you.

Take a few seconds and try and do this with some of the other word pairs. (Ask the group for a couple of examples.)

The second strategy has to do with making the material more meaningful through an elaboration process that has you asking and answering certain types of questions. As you look at the words on the list you could be asking and answering certain questions, such as, "How do the words relate to my previous experience or my own attitudes or emotions?" "How do the words relate to what I already know? "What is a logical relationship between the words?"

When given a specific word pair you could ask yourself, "How do the words as a pair relate to my previous experience or my attitudes or emotions?" For the word pair "COFFEE - STREET" you may remember that your mother always bought "coffee" at a store across the "street." For the pair APPROACH - GUITAR" you might think that you have always wanted to "approach" learning to play "guitar" but you've never gotten around to it.

Another question you might ask yourself is "How do the words relate together to what I already know?" For the words "GIRAFFE - CLOSET" you may think that a "giraffe" would never fit in a "closet" because it is too big and too tall.

A third question you might ask is "Are the words logically related?" For the word pair "HANDLE - TOMATO" you might think that "handling" is something that you do to "tomatoes" to make sure that they are ripe, but not too ripe. You might also look for similarities and differences in the meanings of the words. For the word pair "LUMBER - NOVEL" you might notice that both words are products made from trees (paper in the novel)

but they are different in many respects--lumber still possesses many of the attributes of trees but a novel is quite different: it has print, a picture on its cover, pages, etc.

The important aspect of this question-asking strategy is that it calls for a personal elaboration of both meaning and meaningfulness. You want to elaborate on the information you are given to add meaning to it--to make it more meaningful to you. The more of these types of questions we can ask and answer, the better we can remember the information we are trying to learn.

Are there any questions?

Take a few seconds and use one of the questions or use one of your own and apply it to a couple of word pairs on the sample sheet. (Ask the group for a couple of examples.)

The third approach is actually a combination of a couple of strategies. What you want to do is group the information in some way, and then you can use mental imagery or verbal elaboration to help make your groups more meaningful. One way to group the information in a word pair is to make a sentence out of the two words. For example, for the pair "INSECURITY - REFUSAL" you may use the sentence, "Because of his basic 'insecurity,' the man was certain that the woman's response to his proposal would be a 're-fusal.'" Then you could add an image to this sentence to help you remember it, perhaps a man standing on one knee, anxiously looking up at the face of the woman, waiting for her response.

Another way to group the word pairs is to make up a story about them. For "GIRAFFE - CLOSET" you might make up a story about a stupid giraffe who got stuck in a closet and no one could get him out. Then you could

add images like the illustrations in a child's storybook. You can also include several word pairs in the story if it will help you remember them. For example, the pairs "COFFEE - STREET" and "HANDLE - TOMATO" could be used in a story like "The raggedy old woman bought a cup of 'coffee' from the 'street' vendor and then hobbled over to the fruit seller and began 'handling' the 'tomatoes,'"

Still another way to group word pairs is to find some category into which both words belong. "HAMBURGER - SHAMPOO," for example, are both items that can be purchased in a grocery store. Then you could imagine going into your usual grocery store, going to the meat counter to pick up a package of hamburger and then picking up a bottle of shampoo from the shelves.

Are there any questions?

Take a few seconds and apply this strategy to some of the other word pairs in the sample list. The important thing is to make things more meaningful to you. (Ask the group for a couple of examples.)

Reading Task

Now read the sample passage. (Hand out passage.)

The same three strategies we have been discussing can be used to help you learn the contents of a written passage.

As you read the passage you may have noticed images popping into your head. You can use these images to help you remember what you have read. For example, "...in its present form the school should be abolished. I would preserve a few of the facilities of the school--the library, the assembly hall, the gymnasium, the playing field--but as facilities only." This thought could be expressed using two connected images. First, imagine

the abolishment of a school physically--picture your old high school and visualize a huge ball and crane smashing down its walls. The second part of the quotation could be imagined by calling parts of your high school building back into existence, much like a motion picture running backwards. Once the school is back together, think of it as being there without any people in it.

Take a few seconds and try to do what we have just done with another part of the first paragraph.

(Ask the group for a couple of examples.)

For the second strategy you can elaborate on the material you read by asking and answering questions such as: "What is the purpose of this material?" or "How does this relate to my experiences, beliefs, attitudes, or emotions?" or "How would most people react to this?" or "What are the implications of what is being said if it were actually done?" or "What are the logical relationships in the material? Does it make good, common sense?" There are other questions that could be asked--this gives you some idea of what to look for and what to do.

In the sample passage we could ask the question, "How does this relate to my experiences, beliefs, attitudes, or emotions?" In reading the passage I might say to myself, "The guy who wrote this must have been reading my mind. He knows exactly how I feel about our system of public education, and the kind of experiences I had in school."

I could also ask questions to try to draw logical implications as I read, like, "If everybody felt the way Kneller feels about schools, what kind of a country would this be?" Then I might answer this question by saying, "This would be a very different type of country if our system of education were changed as radically as Kneller suggests. Young people

would have to learn to manage their time and activities or they might turn to a very wasteful approach to spending their day."

Are there any questions?

Take a few seconds and use one of the suggested questions or one of your own and apply it to the sample passage. (Ask the group for a couple of examples.)

The third method--the grouping strategy--can be applied to reading by grouping the information in the passage and then using mental imagery or verbal elaboration to make the grouping more meaningful. As you read something, certain ideas, facts, or names may occur. It is often helpful to be able to place these ideas, facts, or names into some category. This way you can join loose facts into useful groupings. For example in this passage four names are mentioned: Marcel, J. D. Salinger, Teddy, and Camus. You may or may not be familiar with any or all of these names. However, as you read through the passage you encountered these names. If you did recognize any or all of the names it would be easier for you to remember them. On the other hand, if these names were completely new to you then by inventing a category called "people in this passage" or some similar grouping title, you would have some handle on this portion of the reading. An example of a sentence using these four names might be, "Camus sounds like canoe, Marcel sounds like "oh-well"--"Oh-well, J. D. and Teddy are riding in the canoe." Perhaps more meaning could be added by forming an image of three guys, Teddy, J. D., and Marcel, actually riding in a canoe. This same approach of categorizing things, and elaborating on them as you go, can be applied to any part of the passage as long as the grouping makes sense to you. It may not be meaningful to anybody but you.

Are there any questions?

Take a few seconds and apply this strategy to some other ideas or facts in the passage. The important thing is to make things more meaningful to you. (Ask the group for a couple of examples.)

Here is your first practice task--a paired-associate list. As you go through the list, try to use all three strategies: imagery, elaboration, grouping. Depending on the nature of the word pairs, one, two, or a combination of strategies may make the most sense to use. The more strategies you are able to use, the better. We have provided paper so you can write down the strategies as you come up with them. I will be walking around to see what and how you are doing. Remember, this is not an intelligence test. You are helping us to learn about the effectiveness of these strategies. So work hard and carefully. You will have 8 minutes to work on this first task. Remember to write down the aids you use and also, to put your name on each of the sheets of paper you use. Are there any questions?

Okay, begin.

The second practice task is a written passage. As you go through it, try to use all three of the strategies: imagery, elaboration, and grouping. The more strategies you are able to use the better. I'll be walking around to see how you're doing so remember to write down the aids you use as you come up with them. You will have 10 minutes to work on this reading.

Are there any questions?

Okay, begin.

Here is your third (fourth) practice task. Work carefully, and try to use as many of the strategies as possible. You will not be writing down the strategies you use on this task so be sure to concentrate on

your use of the strategies.

Are there any questions? Okay, you will have 8 (10) minutes to work on this task. Begin.

Testing Instructions

Now we would like to find out how well you have learned the strategies that you have practiced, and also to find out how effective the strategies are in helping you learn the material. There will be four tests, using tasks that are similar to the tasks you practiced the strategies on. Our major concern is with the effectiveness of the strategies so try to use all three--imagery, elaboration, and grouping--to help you learn the material.

Paired-Associate Task

Paired-Associate Study Instructions. For the first task, I'm going to present pairs of words to you on the screen up front. Your task is to use the learning strategies to associate the two words of each slide together, so that later when you are shown the first word--the one on the left--you will remember the second word. For example (show example), you should learn this pair so that if I later showed you the word SNAKE by itself, you could give me the word LIMB. Or with this pair (show example), you would learn it so that if I later showed you the word COFFEE by itself, you could remember the word STREET.

First, each pair will be presented on the screen. You will have 10 seconds to study each pair. After all of the pairs have been shown I am going to present the left-hand word of each pair (the first word) by itself, and you will have 8 seconds to write down the right-hand word that was with it on the slide.

Any questions?

Remember, first you will see the pairs and you will have 10 seconds to study each one. Do not write anything down during this presentation. Then I will show you only the left-hand word from each pair and you will try to write down the right-hand word that was with it on the slide.

Paired-Associate Test Instructions. (Hand out IBM cards.) Write your name at the top of the card deck.

Now I am going to present just the left-hand word of each of the pairs and you will have 8 seconds to write down the corresponding right-hand word.

Please put your words on the blank sides of the IBM cards I handed out, using just one card for each word. The cards are numbered in order in the upper left-hand corner. I will call out the number of each word as it is presented so you can keep your place by making sure the number of the card is the same as the one I call out. So if you can't think of a word for a given item, turn that card over face down anyway, and use the next card for the next word.

Any questions?

Begin - "one."

Free Recall Task

Free Recall Study Instructions. (Hand out paper.)

Please write your name at the top of the page and then turn it over.

I am going to present single words to you on the screen up front. Your task is to learn the words so that later you can remember as many of them as possible, in any order. You will have just 6 seconds to study

each word as it is shown on the screen.

After all of the words have been presented you will have 2 minutes in which to write down as many of the words as you can remember, in any order.

Please do not write anything at this time. Just study the words. Try to use the strategies we have practiced to aid you in learning the words.

Any questions?

Begin.

Free Recall Test Instructions. Turn over your paper now.

You will have 2 minutes to write down as many of the words as you can remember. You can write them in any order.

Begin.

Reading Task

For your final task you will be given two written passages, one at a time. Read them carefully, and use as many of the strategies as possible to help you learn the content of each passage. After you have been given time to read the passage, I will collect the reading and give you some questions to answer about what you have read. You will have 5 minutes to read this first passage.

Are there any questions?

(Hand out reading.)

Begin reading.

Okay, stop reading and hand the readings in to me.

Here are the questions. You will have 2 minutes to answer the questions.

Stop. Make sure your name is on the paper.

Here is your second reading. Read it carefully and remember to use as many strategies as possible. You have 6 minutes to read this last passage.

Are there any questions?

(Hand out passage.)

Begin reading.

Stop reading and hand the readings in to me. Here are the questions for the last reading. Make sure to put your name on the sheet. You will have 3½ minutes to answer the questions.

Stop. Make sure your name is on both answer sheets. Put the answer sheet in your folder.

APPENDIX B

Student Packet for the Order of

Training Materials Study

Sample Passage

Like Marcel, I believe that, in its present form, the school should be abolished. I would preserve a few of the facilities of the school--the library, the assembly hall, the gymnasium, the playing field--but as facilities only. Young people could use these for studying and for group activities, such as games, playacting, and musical performances. Instead of going to school for an education, the young person would go to a teacher. Student and teacher would meet in the teacher's home, or in the student's, or, if appropriate, on location. Sometimes the student would come alone, and sometimes with friends. I believe that under this arrangement the student would accomplish much more and in much shorter time than he does now. For the teacher would meet the student where he individually is.

I realize that this is a highly radical proposal and will be called impractical. But today's public schools are little more than a hundred years old and when first conceived, were also called radical and impractical. I cannot help recalling the kind of school that J. D. Salinger's Teddy wanted. He would first "assemble" the students and "show them how to meditate." He would "try to show them how to find out who they are, not just what their names are and things like that...." He would even try to "get them to empty out their heads" of all the stuff their parents and others had told them. If, as Camus said, "There is a whole civilization to be remade," Teddy's school would be an ideal way to start remaking it. As I have said before, teachers alone cannot rebuild a civilization. But they can do much to educate individual pupils who may one day set about

doing so.

George Kneller, Foundations of Education, 1971, p. 264.

Training Instructions

This study is concerned with how well people can learn the contents of a written passage. We are going to use this sample passage to demonstrate a number of different methods or strategies that should help you learn the material. We will work through this sample passage a number of times so you can see what I mean by each of the different strategies. Then you will practice the strategies on other different passages. At the very end we will, together, test the effectiveness of the strategies on these passages.

Take your time and read this passage carefully. (Please refer to "SAMPLE PASSAGE.")

All of the strategies that we will be learning are aids in organizing, remembering, and adding meaning to what you read. We are going to learn them one at a time so you can get a feel for each of them. Then we will apply all the strategies to this sample passage.

The first strategy deals with what is called mental imagery. The strategy using mental imagery calls for forming a picture in your head of the person and events you read about in the passages. For example, if you read a story about a boy named Joe who went to France, you might picture Joe Namath atop the Eiffel Tower. This is what is meant by mental imagery. We are going to concentrate on these images to better learn the material. For example, one section of the sample passage says, "...in its present form, the school should be abolished. I would preserve a few of the facilities of the school--the library--the assembly hall, the gym-

nasium, the playing field -- but as facilities only." This thought could be expressed using two connected images. First, imagine the abolishment of a school physically--picture your old high school and visualize a huge ball and crane smashing down its walls. The second part of the quotation could be imagined by calling parts of your high school building back into existence, much like a motion picture running backwards. Once the school is back together think of it as being there without any people in it.

Another example is to picture a group of young people playing basketball in the gymnasium or football on the playing field.

A fourth image might be to picture a boy named Teddy assembling a group of students on the football field and teaching them to sit cross-legged and meditate.

Additionally, you might imagine a picture of students, going in groups to an assembly hall to listen to a speech by J. D. Salinger. Afterwards, they run to the gym and the playing field where some students sit and meditate on Camus.

In another image you might see a group of radical students outside the assembly hall protesting archaic educational methods and threatening to abolish the schools.

Or you might picture a large empty gymnasium with one teacher and one student sitting in the middle of the floor discussing the rebuilding of civilization. The next day you see them as brick masons actually building this new civilization.

A further image might be of a big teddy bear with J. D. Salinger written across its front going around shaking all the worthless stuff out of students' heads.

Take a few moments and try to do what we have just done with another part of the first paragraph of the sample passage. Try to think of several examples, and make notes about them on the scratch paper.

When you are through using mental imagery on the sample passage, stop so we can discuss a few of your examples.

The second strategy has to do with making what you have read more meaningful through an elaboration process in which you ask and answer certain types of questions. As you read through a passage, you could ask and answer questions in which you actively process the information. Such questions might be: "What is the purpose of this material?" or "How does this relate to my experiences, beliefs, attitudes, and emotions?" or "How would <u>most</u> people react to this?" or "What are the implications of what is being said, if it were actually done?" or "What are the logical relationships in the material? Does it make good, common sense?" There are other questions that can be asked and answered--this gives you some idea of what to look for and what to do.

In the sample passage you would ask the question, "How does this relate to my experiences, beliefs, attitudes, or emotions?" One response upon reading this passage might be to say to yourself, "The guy who wrote this must have been reading my mind. He knows exactly how I feel about our system of public education and the kind of experiences I had in school. As it is now, people don't learn much of anything!" Or I might say to myself, "Wow! The person who wrote this must be some kind of radical nut. Doesn't he know the 60's are over? Our schools aren't perfect, but they're still the best in the world. I remember some good learning experiences I could <u>not</u> have gotten with Kneller's (the author of the sample passage)

approach."

You could also try to draw logical inferences as you read; for example, you could ask the question, "If everybody felt the way Kneller feels about schools, what kind of a country would this be? How might young people be different if they did not have to go to school as much as they do now?" Then, your reply to the question you just asked might be, "This would be a very different type of country if our system of education were changed as radically as Kneller suggests. Young people would either learn to manage their time and activities personally, or they might turn to a very wasteful approach to spending their day."

These are examples of asking and answering questions about things you read, calling upon a personal elaboration of both meaning and meaningfulness. The more of these types of questions you can think about and answer the more able you are later to remember and use the information, thoughts, or ideas you are trying to learn.

Another way to elaborate the material would be to think about the purpose or need for the material. You might ask such questions as, "What is wrong with our educational system that would cause anyone to criticize it?" Or you could relate it to your own characteristics by asking questions such as, "Would I be able to learn in a school system such as Kneller proposes." Further, you could ask if other people, in general, would also benefit from such a system, or would such a system even work in a society like ours. How would other people react to this passage? Would they agree with it, or be shocked by its ideas? These are further questions you might ask yourself to help you understand or remember the material better.

One other way you might elaborate upon this material would be to look

for common sense or logical relationships in the material. Some passages form concrete logical relationships naturally whereas other passages lend themselves more to abstract logical relationships. This particular passage is an example of one that presents abstract relationships. For example, if the school in its present form were abolished, then it would be common sense to assume other alternatives such as the one suggested by J. D. Salinger's Teddy.

Take a few moments and use one of the suggested questions or one of your own and apply it to the sample passage. Please make notes about the ideas or examples you come up with, using the scratch paper to write on. When you are through using meaningful elaboration on the sample passage, stop so we can discuss a few of your examples.

This next approach is actually a combination of a couple of strategies. This time you will look at a part of the sample passage and group information. Then you could use mental imagery or form a sentence to make the grouping more meaningful. As you read something, certain ideas, facts, and names may occur. As they appear in a passage it is helpful to be able to place these ideas, facts, or names into some category. This enables you to learn by joining together what were before loose facts. You could then generate a mental image or sentence using all the members of this group. For example, in this passage four names are mentioned: Marcel, J. D. Salinger, Teddy, and Camus. You could invent a category called "People in the Passage" or some similar grouping title to give you some handle on this portion of the reading. Examples of a sentence or phrase using these four names might be, "Camus sounds like canoe, Marcel sounds like 'oh-well'--oh, well, J. D. and Teddy are riding in the canoe." Even more meaning could be created by picturing a mental image of a teddy bear, a

juvenile delinquent, and poor Marcel, actually riding in a canoe. This same approach of categorizing things and elaborating on them as you go can be applied to any part of the passage as long as the grouping makes sense to you. It may not be meaningful to anyone but you.

Take a few moments and apply this strategy to some other ideas or facts that are in the sample passage. The important thing is to make things more meaningful to you. Please make notes about the examples or ideas you come up with, using the scratch paper to write on. When you are through with this strategy, stop so we can discuss a few of your examples.

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